

REMARKS

The Office Action of November 23, 2005 has been received and its contents carefully considered.

Claims 1 to 25 are all the claims pending in the application, prior to the present amendment.

The Examiner has not acknowledged applicants' claim for foreign priority or receipt of the certified copy of the priority document which was filed on September 9, 2004. Applicants request the Examiner to make such an acknowledgement.

Applicants have canceled non-elected claims 16 to 21, and claims 22 and 25, which depended either directly or indirectly, from the non-elected claims.

Applicants have amended the specification by adding a new paragraph at page 21. The new paragraph appears in applicants' provisional application No. 60/440,385, the contents of which are specifically incorporated by reference into the present application, as stated at page 1 of the present specification. Applicants hereby state that the material being inserted into the specification is material previously incorporated by reference and that the amendment contains no new matter.

Claims 2-15, 22, 24 and 25 have been rejected under the second paragraph of 35 U.S.C. § 112 as indefinite.

The Examiner sets forth five reasons for this rejection in Paragraph 2 of the Office Action. Applicants discuss each reason below.

(a) Claim 2 has been rejected as indefinite because it is unclear whether the metallic layer in claim 2 is the same metal as defined in claim 1 or is a different metal.

The metal in claim 2 is the same as the metal in claim 1.

In order to further make this clear, applicants have amended claim 2 by adding, at the end of the claim, the phrase --comprised of the metal that intrudes into the cubic boron nitride abrasive grain--.

(b) Claim 12 has been rejected as indefinite with respect to the recitations that define the first and second coating layers. The Examiner states that the second coating layer is defined as having “a composition different from that of the first layer”. The Examiner asks that if both the first and second coating layers can be nickel, how are they different?

The Examiner states that “if the second layer is only limited [to] a nickel layer,” how can the first layer be a nickel layer and yet be different and have a different composition?

Applicants submit that the Examiner has misinterpreted the meaning of claim 12. In particular, the term “electroless-plated nickel coating” does not refer to a coating that contains “only” nickel. The present specification, at page 24, last two lines to page 25, line 5, states that the “coatings of a nickel phosphorous compound ... [can have] phosphorous at any ratio, or [can have] elements other than phosphorous...[and] are referred to as a nickel coating...formed by electroplating or electroless plating....

Thus, the term “nickel coating” in claim 12 includes nickel coatings having different amounts of phosphorous, and/or having elements other than phosphorous. The second layer can contain both nickel and phosphorous or nickel and another element, and the amounts of phosphorous and the other element can be different between the first layer and second layer. Since the phosphorus in the coatings can be at different ratios, it is clear that the compositions of the different layers can be different, but still be based on nickel. Both layers would be correctly characterized as comprising nickel layers, but which have different compositions.

In view of the above, applicants submit that claim 12 is not indefinite.

(c) Claim 13 has been rejected as indefinite with respect to the definitions of the second and third coating layer. The Examiner asks that if both the second and third coating layer can be nickel, how are they different?

Similar to the discussion in subparagraph (b) above, applicants submit that the Examiner has misinterpreted the scope of claim 13. Thus, the third layer is not limited to “only” a nickel layer, but can be comprised of a nickel layer that contains phosphorous or other elements in different amounts.

(d) Claim 14 has been rejected as indefinite because it is unclear whether claim 14 is (1) defining a coating amount of a metallic material relative to the abrasive, or (2) defining the amount of surface that is coated with the metallic layer.

In response, applicants submit that claim 14 is defining the coating amount of the metallic material relative to the entire metal-coated cubic boron nitride abrasive including the metallic coating, and that this would be the normal interpretation of this claim. Applicants do not understand why the Examiner asserts that claim 14 can be interpreted as referring to the amount of surface that is coated. Claim 14 refers to a weight %, and it makes no sense to refer to the amount of surface that is coated by a weight % unit.

The Examiner further states that although a ratio can be determined from the weight % defined, the claim is defining a percentage, and is not a conventionally claimed ratio, that is, A:B. The Examiner states that the claim should be rewritten in terms of the percentage and not ratio.

In response, applicants have amended claim 14 as set forth above to recite amounts in terms of percentages.

(e) Claim 15 has been rejected as indefinite because it is unclear as to what the ratio is based on.

The Examiner asks what is the other component besides the coated grain. The Examiner states that the claim does not clearly define a ratio, and therefore the scope of the claim is unclear. The Examiner asks whether the claim is stating that of all the abrasive grains present, 5-100% of the grains are the coated grains. The Examiner states if so, the claim should be rewritten to clearly define this, as long as support is provided in the specification.

In addition, the Examiner states that assuming that the claim is rewritten to support a ratio, although a ratio can be determined from the wt % defined, the claim is defining a percentage and not a conventionally claimed ratio. The Examiner states that the claim should be rewritten in terms of the percentage and not the ratio.

In response, applicants have amended claim 15 as set forth above to recite amounts in terms of percentages.

With respect to the Examiner's comments that it is not clear what the ratio is based on, applicants point out that the present specification, at page 27, lines 5 to 15, makes clear that the ratio is "with respect to the entirety of abrasive grains". Thus, the claim is stating that of all the abrasive claims present, 5-100% are the coated grains. Applicants submit that one of ordinary skill in the art would understand that claim 15 is reciting that of all the abrasive grains present, 5 to 100% are the coated grains.

In view of the above, applicants submit that the claims comply with the requirements of the second paragraph of 35 U.S.C. § 112 and, accordingly, request withdrawal of this rejection.

The Examiner objects to the disclosure of the specification. The Examiner sets forth four reasons for this rejection. These reasons correspond to the reasons that the Examiner set forth above in Paragraph 2 (b), (c), (d) and (e).

In response, applicants have amended the specification in accordance with the above discussion for Paragraphs 2 (d) and 2 (e) with respect to reciting amounts in terms of

percentages. At this point, applicants do not see any need to amend the specification with respect to Paragraphs 2 (b) and 2 (c) relating to the composition of the second and third layers.

Claims 1, 2, 10, 15 and 22 have been rejected under 35 U.S.C. § 102(b) as anticipated by US Patent 5,062,865 to Chen et al.

In response, applicants have amended claim 1 to incorporate the subject matter of claim 3, which was not subject to this rejection. Applicants have canceled claim 3, and as noted above, have canceled claim 22.

In view of the above, applicants submit that Chen et al do not disclose the subject matter of claims 1, 2, 10 and 15 as amended above and, accordingly, request withdrawal of this rejection.

Claims 1-7, 10, 15 and 22-25 have been rejected under 35 U.S.C. § 103(a) as obvious over Chen et al in view of US Patent 4,011,064 to Lee et al.

As noted above, claim 3 has been canceled and its subject matter has been incorporated into claim 1. In addition, claims 22 and 25 have been canceled. Thus, claims 1, 2, 4 to 7, 10, 15, 23 and 24 are subject to this rejection.

Applicants submit that Chen et al and Lee et al do not disclose or render obvious the subject matter of claims 1, 2, 4 to 7, 10, 15, 23 and 24 as amended above and, accordingly, request withdrawal of this rejection.

The present invention as set forth in claim 1 as amended above is directed to a metal-coated cubic boron nitride abrasive grain comprising a cubic boron nitride abrasive grain, wherein the cubic boron nitride abrasive grain has a groove formed on the surface thereof, wherein the groove formed on the surface of the cubic boron nitride abrasive grain has a portion in which the ratio (w/d) of the width (w) of the portion to the depth (d) thereof is less than 1, and a metal intruding into the groove of the cubic boron nitride abrasive grain.

Chen et al discloses a superabrasive grit that can be made of cubic boron nitride. Chen et al disclose that the grits are optionally roughened at first, and then coated with a metal. The Examiner states that since the surface is roughened, it is clear that the metal coating penetrates the uneven part of the abrasive, thus broadly reading on the recitation of claim 1 of the present application of “a metal intruding into the cubic boron nitride abrasive grains”.

With respect to the recitation of a groove in claim 2, the Examiner states that since the surface of Chen et al is roughened, the surface of Chen et al will have grooves formed therein.

With respect to original claims 3-6 (the recitations of claim 3 now being incorporated into claim 1), the Examiner states that it is clear from Chen et al that the surface of the abrasive, prior to coating, has grooves thereon. The Examiner acknowledges that the dimension of the “grooves” in Chen et al might not be apparent from a teaching of “roughening”. The Examiner asserts that it is known that the roughening improves the characteristics of the coating. The Examiner refers to column 3, lines 16-29 of Chen et al. In view of this, the Examiner asserts that the selection of the groove dimensions would have been appreciated by one of ordinary skill in

the art through routine experimentation and optimization, in order to optimize the strength of attachment between the boron nitride and coating.

With respect to original claims 3-6, the Examiner asserts that it is clear from Lee et al that the surface of the abrasive is etched, thus it has grooves thereon, and that although the dimensions of the grooves might not be apparent from the teaching of “etched” alone, it is known that the selection of the groove dimensions, as is dependent of the firing conditions, would have been appreciated by skilled artisans through routine experimentation and optimization in order to optimize the strength of attachment between the boron nitride and coating.

Applicants disagree with the Examiner that the selection of the groove dimensions would have been appreciated by the skilled artisan through routine experimentation and optimization.

As stated at page 21 of the present specification, when a groove does not have a portion in which the ratio of the width to the depth (w/d) is less than 1, the depth of the intrusion of the metal is not sufficient, and retention force will not be sufficiently increased.

Chen et al do not contain any discussion relating to the dimensions of the roughening that occurs. Chen et al measure the roughening by the amount of the grain that is removed during the roughening process. Thus, Chen et al do not have any concept that the dimensions of a groove are important parameters for achieving an improved retention force.

Further, in order to make the state of the art clear with respect to etching, such as in Lee et al, applicants have amended the specification by inserting the following description from applicants' provisional application:

When a groove is formed by means of etching employing a chemical solution, the width of the thus-formed groove increases toward the surface of a cBN grain as viewed in the cross section of the groove, since, in general, the etching rate in a depth direction is equal to that in a direction perpendicular to the depth direction. When an attempt is made to form a deep groove by means of etching, etching in a horizontal direction also proceeds, and therefore, the resultant groove becomes a shallow depression as viewed in cross section. Such a groove formed through etching exhibits poor anchoring effect.

Claim 1 as amended above recites the element of “a groove formed on the surface of the cubic boron nitride abrasive grain, wherein the groove has a portion in which the ratio (w/d) of the width (w) of the portion to the depth (d) thereof is less than 1”. As described above, it is clear to one of ordinary skill in the art that it is impossible to obtain a groove with a dimension of $w/d < 1$ by either “the roughness method of Chen et al” or “the chemical etching method of Lee et al”, even if one sought through routine experimentation and optimization to optimize the strength of attachment between the boron nitride and coating.

Further, the Examiner alternatively takes the position that the term “intruding” in claim 1 is broad enough to cover a diffusion of metal into a surface layer, so that the metal is considered to intrude into the grain by diffusion. In addition, the Examiner relies on Lee et al for a teaching that during coating, diffusion and localized diffusion between the grain and metal atoms occur, resulting in metal atoms penetrating the surface. The Examiner states that although the metal

coatings in Lee et al and Chen et al are different, one of ordinary skill in the art would have appreciated that the same mechanism of diffusion would occur.

In response, applicants submit that the amendment to claim 1 to recite a groove overcomes this alternative position by the Examiner.

In view of the above, applicants submit that claim 1 as amended above would not have been obvious over Chen et al and Lee et al.

In view of the above, applicants submit that Chen et al and Lee et al do not disclose or render obvious the subject matter of claims 1, 2, 4 to 7, 10, 15, 23 and 24 as amended above and, accordingly, request withdrawal of this rejection

Claim 14 has been rejected under 35 U.S.C. § 103(a) as obvious over Chen et al alone or in view of Lee et al, and further in view of EP '635.

Applicants submit that Chen et al, Lee et al and EP '635 do not disclose or render obvious the subject matter of claim 14 and, accordingly, request withdrawal of this rejection

The Examiner relies on EP '635 for a teaching that abrasive particles can be coated with up to 50% of a coating material, based on the weight of the coated grain. The Examiner refers to EP '635 at column 7, lines 16 to 24. It appears to applicants that this is a mistake, and that the Examiner intended to refer to column 5, lines 16 to 24. The Examiner argues that in view of teachings of EP '635, it would have been obvious to employ an amount of up to 50%, and that the amount of coating can be optimized by routine experimentation.

Claim 14 depends from claim 1. Accordingly, applicants submit that claim 14 is patentable for the same reasons as discussed above in connection with claim 1, since EP '635 does not supply the deficiencies of Chen et al and Lee et al.

Claims 1, 2, 15 and 22-25 have been rejected under 35 U.S.C. § 102(b) as anticipated by Lee et al.

As noted above, the subject matter of claim 3, which has not been rejected, has been incorporated into claim 1. Claims 3, 22 and 25 have been canceled.

In view of the above, applicants submit that Lee et al do not disclose the subject matter of claims 1, 2, 15, 23 and 24 as amended above and, accordingly, request withdrawal of this rejection.

Claims 2-7, 14, 15, and 22-25 have been rejected under 35 U.S.C. § 103(a) as obvious over Lee et al.

As noted above, the recitations of claim 3 have been incorporated into claim 1, and claims 3, 22 and 25 have been canceled.

Applicants submit that Lee et al do not disclose or render obvious the subject matter of claims 1, 2, 4 to 7, 10, 15, 23 and 24 as amended above and, accordingly, request withdrawal of this rejection.

In this rejection, the Examiner relies on Lee et al as a primary reference. The Examiner points out that Lee et al disclose that the metal coating penetrates the surface of the boron nitride by etching the surface of the boron nitride, and that defined localized diffusion reactions occur between the grain and the metal atoms. The Examiner states that the metal atoms, therefore, will penetrate the surface.

With respect to claims 3-6, the Examiner states that the dimensions of the grooves might not be apparent from the teachings of an etched surface, but the Examiner argues that the selection of the grooves dimensions, since it is dependent on the firing conditions, would have been obvious as the result of routine experimentation and optimization in order to optimize the strength of attachment between the boron nitride and coating.

As discussed above, when a groove is formed by means of etching, such as in Lee et al, employing a chemical solution, the width of the thus-formed groove increases toward the surface of a cBN grain as viewed in the cross section of the groove, since, in general, the etching rate in a depth direction is equal to that in a direction perpendicular to the depth direction. When an attempt is made to form a deep groove by means of etching, etching in a horizontal direction also proceeds, and therefore, the resultant groove becomes a shallow depression as viewed in cross section. Such a groove formed through etching exhibits poor anchoring effect.

Claim 1, as amended above, recites the element of “a groove formed on the surface of the cubic boron nitride abrasive grain, wherein the groove has a portion in which the ratio (w/d) of the width (w) of the portion to the depth (d) thereof is less than 1”. As described above, it is

clear to a skilled artisan that it is impossible to obtain a groove with a dimension of $w/d < 1$ by “the chemical etching method of Lee et al”, even if through routine experimentation and optimization one sought to optimize the strength of attachment between the boron nitride and coating.

As a result, applicants submit that the present claims would not have been obvious over Lee et al.

In view of the above, applicants submit that Lee et al do not disclose or render obvious the subject matter of claims 1, 2, 4 to 7, 10, 15, 23 and 24 and, accordingly, request withdrawal of this rejection.

Claims 1-15 and 22 have been rejected under 35 U.S.C. § 103(a) as obvious over EP ‘635 in view of Chen et al.

As noted above, the subject matter of claim 3 has been incorporated into claim 1, and claim 3 has been canceled.

Applicants submit that EP ‘635 and Chen et al do not disclose or render obvious the subject matter of claims 1, 2, 4 to 15 and 22 as amended above and, accordingly, request withdrawal of this rejection

The Examiner argues that EP ‘635 disclose a metal coated cubic boron nitride abrasive having the claimed size wherein the coating is one or more layers of an active coating material such as nickel, cobalt and mixtures thereof with the coating amount being up to 50%.

The Examiner acknowledges that EP '635 does not disclose that the uncoated boron nitride grain has a grooved surface, but argues that in view of Chen et al it would have been obvious to roughen the surface and thereby form grooves.

Applicants have discussed Chen et al in detail above, and rely on that discussion.

Thus, Chen et al do not contain any discussion relating to the dimensions of the roughening that occurs. Chen et al measure the roughening by the amount of the grain that is removed during the roughening process. Thus, Chen et al do not have any concept that the dimensions of a groove are important parameters for achieving an improved retention force.

In view of the above, applicants submit that EP '635 and Chen et al do not disclose or render obvious the subject matter of claims 1, 2, 4 to 15 and 22 as amended above and, accordingly, request withdrawal of this rejection.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. § 1.111
Application No. 10/751,116

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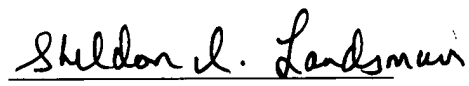
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